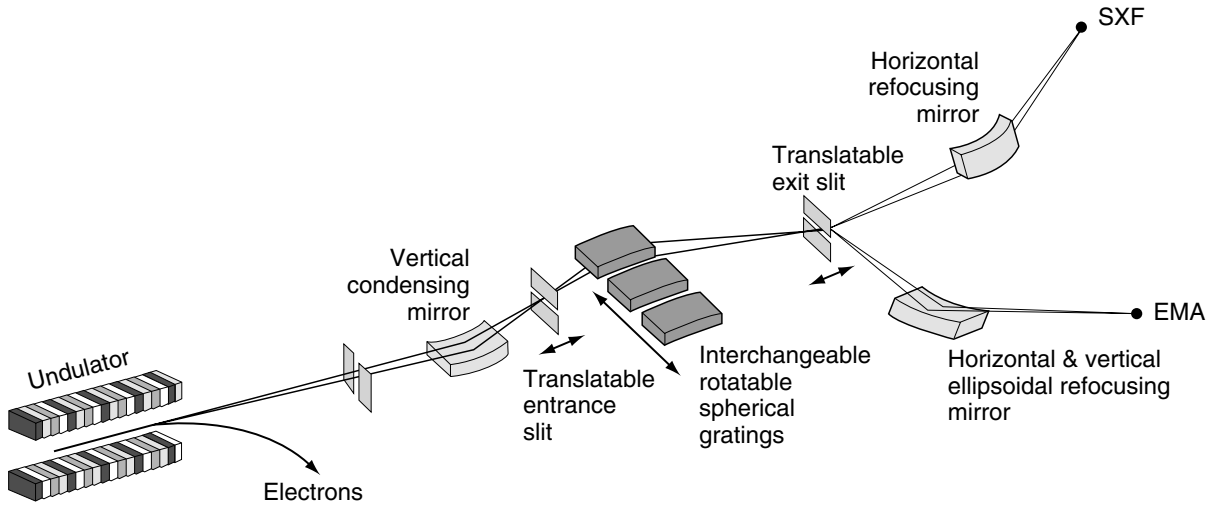
High Resolution and Flux for Materials and Surface Science • Beamline 8.0.1

Berkeley Lab • University of California

Beamline Specifications

Photon Energy Range (eV)	Photon Flux (photons/s)	Spectral Resolution (E/ΔE)	Spot Size (μm)	Availability
65–1400 (at 1.5 GeV) **~80–1400** (at 1.9 GeV)	**~10^{11}–6 × 10^{15}** (dependent upon resolution & energy)	**<8000** (typical)	**100**	**NOW**



Schematic layout of Beamline 8.0.1.

Beamline 8.0.1 serves two permanently placed, PRT-owned experimental stations (each described in a separate data sheet) for high-resolution spectroscopy and imaging of materials and surfaces.

An ellipsoidal mirror electron energy analyzer (EMA) for x-ray photoelectron spectroscopy (XPS), angle-resolved photoelectron spectroscopy (ARPES), and near-edge x-ray absorption fine-structure spectroscopy (NEXAFS) and a soft x-ray fluorescence (SXF) spectrometer are mounted on a movable platform that rides on air bearings. A rotating platform allows the stations to share beamtime so that one of them is in line to receive synchrotron light. A flexible bellows joins the two stations to the beamline.

The beamline operates over the energy range from 65 to 1400 eV (at 1.5-GeV electron-beam energy) using a 5-cm-period undulator and a spherical-grating monochromator (SGM) with three interchangeable gratings. The resolution of the monochromator is selectable by means of variable entrance- and exit-slit widths. Spectral resolutions above 6,000 have been achieved. The flux at a calculated resolution of 10,000 varies above and below 10^{12} photons/s. Focusing is optimized by moving both the entrance and exit slits to satisfy the Rowland geometry. ■

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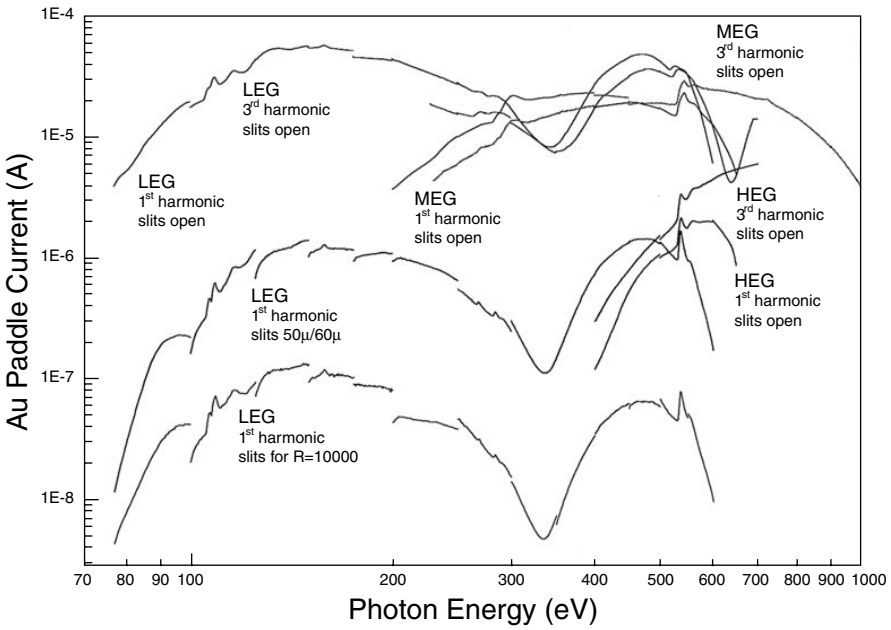
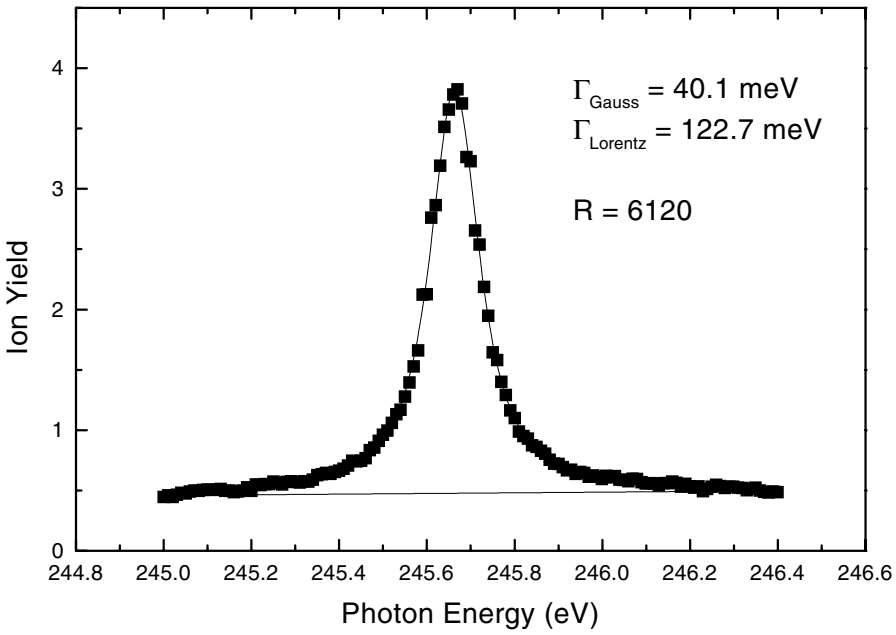


High flux over the full spectral range. *The mononchromator operates in both the first and second orders with three gratings (LEG, MEG, and HEG) with line densities of 150, 380, and 925 lines/mm. The flux was measured for an entrance-slit width of 50 μm, an exit-slit width of 60 μm, and an optimized exit-slit position. The curves give the results of measurements made at various harmonics of the U5 undulator with the ALS operating at 1.9 GeV, normalized to a 400-mA beam current. The flux with slits narrowed to give a calculated resolution of 10,000 is about 10^{12} photons/s.*



Monochromator resolution. *Gas-phase ion-yield photoabsorption spectrum at the argon 2p→4s resonance showing a monochromator resolution of 40.1 meV corresponding to a resolving power (E/ΔE) in excess of 6000. Data courtesy of D. Lindle, O. Hemmers, H. Wang, and D. Hansen (University of Nevada, Las Vegas); R. Püttner (Freie Universität Berlin); and C. Heske (ALS).*

This beamline is available to independent investigators by submitting a proposal.

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